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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/718,583	11/24/2003	Bruce C. S. Chou	3722-0170P	1689

2292 7590 12/13/2005

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EXAMINER
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KWOK, HELEN C

ART UNIT	PAPER NUMBER
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2856

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/718,583

Applicant(s)

CHOU, BRUCE C. S.

Examiner

Helen C. Kwok

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 and 9-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-7, 13 and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,581,034 (Dao et al.) in view of Publication titled "Liquid-Vapor Phase Transition and Bubble Formation in Micro Structures" (Lin et al.).

Dao et al. discloses a convective accelerometer and inclinometer comprising, as illustrated in Figures 1-21, a substrate 20; a heater 16 arranged on the substrate; at least two temperature sensing members 12, 14 symmetrical arranged at opposite side of the heater and on the substrate; a cap 22 arranged above the substrate to cover and encapsulate the heater and the sensing members; and a liquid filled into a chamber formed between the cap and the substrate. (See, column 3, line 44 to column 4, line 51; column 7, lines 44-54). The only difference between the prior art and the claimed invention is the liquid is heated until a temperature of the heater reaches a vaporization point of the liquid wherein a thermal bubble surrounded by the liquid is being gradually formed around the heater due to phase transition from liquid to gas and a size of the bubble is kept substantially constant as the temperature difference is being sensed. Lin et al. discloses a liquid-vapor phase transition and bubble formation in microstructures

comprising, as illustrated in Figures 1-11, a heater placed on a substrate is encapsulated with a cap to form a cavity therein is filled with a liquid (i.e. water) such that when the temperature of the heater reaches a vaporization point of the liquid, a thermal bubble surrounded by the liquid is being gradually formed around the heater due to phase transition from liquid to gas while the size of the bubble is kept substantially constant by controlling the temperature and the liquid being used. (See, pages 52-57). As taught on page 52, under "1 Introduction", it suggests that the bubble sizes are controllable. Furthermore, under "Discussion and Conclusion", it mentions that once the bubble is formed within a confined area, the growing of a bubble (i.e. size of the bubble) is much more difficult since the bubble occupies a greater portion of the area near the heater. It would have been obvious to a person of ordinary skill in the art at the time of invention to have readily recognize the advantages and desirability of heating the liquid to a temperature such that a thermal bubble is formed due to a phase transition as suggested by Lin et al. to the sensor of Dao et al. to provide a novel accelerometer based on thermal convection that has only one moving element, namely a bubble of heated air hermetically sealed inside a sensor package cavity wherein the bubble moves in a manner analogous to the external force being applied.

With regards to claims 2-6, 13 and 20-21, Dao et al. further discloses the substrate is of silicon; the material for the heater and the temperature sensing members is metal (i.e. platinum or tungsten) and the temperature sensing members is a thermister such that the inertial sensor is being applied to an accelerometer or an inclinometer. (See, column 6, lines 21-65).

With regards to claim 7, Lin et al. further discloses that the liquid is water. (See, Abstract).

3. Claims 1-7, 9, 11 and 13-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,182,509 (Leung) in view of Publication titled "Liquid-Vapor Phase Transition and Bubble Formation in Micro Structures" (Lin et al.).

Leung discloses an accelerometer comprising, as illustrated in Figures 1-16, a substrate 10; a heater 23 arranged on the substrate; at least two temperature sensing members 22,24 symmetrical arranged at opposite side of the heater and on the substrate; a cap arranged above the substrate to cover and encapsulate the heater and the sensing members; and a liquid filled into a chamber formed between the cap and the substrate. (See, column 3, line 24 to column 4, line 33). The only difference between the prior art and the claimed invention is the liquid is heated until a temperature of the heater reaches a vaporization point of the liquid wherein a thermal bubble surrounded by the liquid is being gradually formed around the heater due to phase transition form liquid to gas and a size of the bubble is kept substantially constant as the temperature difference is being sensed. Lin et al. discloses a liquid-vapor phase transition and bubble formation in microstructures comprising, as illustrated in Figures 1-11, a heater placed on a substrate is encapsulated with a cap to form a cavity therein is filled with a liquid (i.e. water) such that when the temperature of the heater reaches a vaporization point of the liquid, a thermal bubble surrounded by the liquid is being gradually formed around the heater due to phase transition form liquid to gas while the

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size of the bubble is kept substantially constant by controlling the temperature and the liquid being used. (See, pages 52-57). As taught on page 52, under "1 Introduction", it suggests that the bubble sizes are controllable. Furthermore, under "Discussion and Conclusion", it mentions that once the bubble is formed within a confined area, the growing of a bubble (i.e. size of the bubble) is much more difficult since the bubble occupies a greater portion of the area near the heater. It would have been obvious to a person of ordinary skill in the art at the time of invention to have readily recognize the advantages and desirability of heating the liquid to a temperature such that a thermal bubble is formed due to a phase transition as suggested by Lin et al. to the sensor of Leung to provide a novel accelerometer based on thermal convection that has only one moving element, namely a bubble of heated air hermetically sealed inside a sensor package cavity wherein the bubble moves in a manner analogous to the external force being applied.

With regards to claims 2-6, 9, 11 and 13-21, Leung further discloses the substrate is of silicon; the material for the heater and the temperature sensing members is metal (i.e. platinum or tungsten); the substrate is anisotropic etched to form a groove 20 such that the heater and the temperature sensing members are suspended above the groove; and the temperature sensing members is one of a thermister, thermocouple, thermopile such that the inertial sensor is being applied to an accelerometer or an inclinometer. (See, column 4, line 34 to column 8, line 20).

With regards to claim 7, Lin et al. further discloses that the liquid is water. (See, Abstract).

4. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over either U.S. Patent 5,581,034 (Dao et al.) or U.S. Patent 6,182,509 (Leung) as applied to claim 9 above, and further in view of U.S. Patent 6,171,880 (Gaitan et al.)

With regards to claims 10 and 12, Gaitan et al. discloses a convective accelerometer comprising, as illustrated in Figures 1-5, the heater is composed of a suspended membrane 14 having a plurality of symmetrical bridge beams extending outwardly from four corners of the membrane and the temperature sensing members 20,22,24,26 are supported by at least one of the bridge beams. (See, column 4, line 11 to column 5, line 44). It would have been obvious to a person of ordinary skill in the art at the time of invention to have readily recognize the advantages and desirability of employing the structural arrangement of Gaitan et al. to the apparatus of either Dao et al. or Leung to provide a more efficient and economical apparatus which enables batch fabrication of the sensor devices herein a very large number of temperature sensing and heater elements of the devices are first patterned in parallel on a common substrate and the maskless etching operation is carried out for all devices at the same time. (See, column 2, line 52 to column 3, line 16 of Gaitan et al.).

### ***Response to Amendment***

5. Applicant's arguments with respect to claims 1-7 and 9-21 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

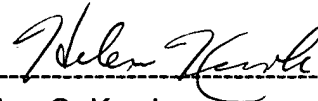
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Helen C. Kwok whose telephone number is (571) 272-2197. The examiner can normally be reached on 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron E. Williams can be reached on (571) 272-2208. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in cursive script, reading "Helen Kwok", is written over a horizontal dashed line.

Helen C. Kwok  
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hck  
December 8, 2005